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The Future of Urban Water Services in Latin America

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In recent decades, problems with the provision of drinking water and sanitation services around the world have increasingly been addressed by attempts at privatisation, recasting clean water as an essentially economic, rather than public, good. This approach gained particular acceptance in Latin America, but with limited success. In order to address the full range of social, economic and environmental values necessary to sustain water resources over time, public and governmental involvement in establishing integrated water management, pursuing 'soft path' approaches, assuring stakeholder input and setting policy will be essential to the process.

Keywords: urban water services, privatisation, integrated water resources management, water soft path, Latin America, sustainable development.

During the 21st century, there will be little margin for error in the management of water resources. Available fresh water amounts to less than one-half of 1 per cent of all water on the planet; the remainder is sea water, or is frozen in glaciers or polar ice (World Health Organisation, 2002: 1). Fresh water resources are unevenly distributed in place and time. At present, approximately 900 million people around the world lack access to adequate amounts of clean water, and over 2.5 billion lack basic sanitation services (WHO/UNICEF, 2010). Combined with increases in deforestation, urbanisation, manufacturing, water diversion projects and inefficient industrial farming, these conditions have contributed to a situation in which the long-term sustainability of water for human and environmental needs is becoming much less certain (Barghouti, 2002). The uncertainty is magnified by the potential effects of global warming and the needs of a projected 2050 population of over 9 billion people (Wolff and Gleick, 2000).

The disease burden resulting from unsafe water, sanitation and hygiene is substantial. The World Health Organization (WHO) bases its evaluation of total disease risk on multiple factors, including ingestion of unsafe water, contact with unsafe water, lack of water linked to inadequate hygiene, poor personal and domestic hygiene and agricultural practices, and poor management of water resources. In addition to the diarrhoeal diseases, unsafe water, sanitation and hygiene are risk factors closely associated with schistosomiasis, trachoma, ascariasis, trichuriasis and hookworm disease, and they are important determinants in a number of other diseases, such as yellow fever, malaria,

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dengue, filariasis, hepatitis A and hepatitis E, typhoid fever, arsenicosis, fluorosis and legionellosis, some of which represent significant threats at the global level. Analysing all factors, the WHO has estimated that, worldwide, water is implicated in 80 per cent of all sickness and disease (WHO, 2002).

In addition to threats related to water quality and disease, there are increasing concerns that quantities of fresh water will not be sufficient to meet human and environmental needs. Global water consumption is doubling every twenty years, more than twice the rate of human population growth (Gleick et al., 2001). Approximately 18 per cent of the total arable land in the world is now used for irrigated agriculture, producing more than 33 per cent of total agricultural output (Food and Agriculture Organization of the United Nations, 2000). Irrigation is currently responsible for 70 per cent of global water withdrawals (90 per cent of withdrawals in low-income countries); projections indicate that by 2030 there will be a more than 20 per cent expansion of irrigated areas (Food and Agriculture Organization of the United Nations, 2000). If current trends continue, it is estimated that approximately two-thirds of the world's population will live in water-stressed areas by the year 2025 (United Nations International Year of Freshwater, 2003).

At the Millennium Summit of the United Nations (September 2000), the international community responded to these and other development issues by adopting the Millennium Development Goals (MDGs). Among others, the MDGs now include commitments to reduce by half the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015 (United Nations, 2009). To achieve these targets, approximately 880 million more people will require access to some form of improved water supply, and an additional 1 billion, 200 million people will require improved sanitation facilities (United Nations, 2009).

In Latin America, approximately 220 million people now live in poverty. In order to meet the MDG targets for water in this region, around 123 million additional people in urban areas and 23 million additional people in rural areas will require access to improved water supply. Meeting the MDG sanitation target will require that 131 million additional urban dwellers and 32 million rural inhabitants in Latin America be given access to improved services (United Nations, 2009). These are difficult targets, and progress towards them has been slow.

This article summarises the debate that led to the popularity of privatisation as a response to the need to provide more efficient, equitable and sustainable water services in developing countries. It addresses problems associated with several privatisation attempts in Latin America and suggests a strategy combining integrated water resources management with what have come to be known as 'soft path' techniques. As the costs of constructing, maintaining and replacing traditional capital-intensive approaches continue to rise, the future of water services, not only in Latin America, but many other developing countries, may take a form similar to this integrated 'soft path' strategy.

Privatisation and its Effects

Historically, the bulk of water supply and sanitation services have been provided by national and municipal governments, because these services are viewed as social or public needs, more appropriately managed by public entities, with the obligation to promote public health and safety. This approach had long been accepted in Europe, but during the twentieth century, was also taken up by governments in many developing

countries (López et al., 2007; Hall and Lobina, 2008). The private sector was considered an inappropriate fit, because it is not normally focused on issues of poverty, underdevelopment or environment (Lobina and Hall, 2003). The primary emphasis of the private sector is on commercial contractual relationships and the generation of profits by providing physical infrastructure and services, not by encouraging a community's sense of ownership over a water project, or engaging with poor communities in the longer-term process of development (Lobina and Hall, 2003).

Though most water managers understand the importance of a multi-dimensional strategy in achieving water resource sustainability (World Summit on Sustainable Development, 2002), during the late 1980s much of the policy debate became more single-mindedly focused on market-driven approaches to water services. In 1992, the International Conference on Water and the Environment, held in Dublin, established general principles for action to reverse trends toward excessive consumption, pollution and rising threats from drought and floods. The conference reports set out recommendations for action at the local, national and international levels, which collectively came to be known as the Dublin Principles (International Conference on Water and Environment, 1992).

These statements expressed important considerations for the establishment of water management regimes. Principle 1 acknowledged that fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment. Principle 2 emphasised that water development and management should be based on a participatory approach, involving users, planners and policymakers at all levels. Principle 3 expressed the understanding that women play a central part in the provision, management and safeguarding of water. Principle 4 asserted that:

> Water has an economic value in all its competing uses and should be seen as an economic good. However, it is recognised that within this principle, it is vital to recognise first the basic right of all human beings to have access to clean water and sanitation at an affordable price. Past failure to recognise the economic value of water has led to wasteful and environmentally damaging uses of the resource. Managing water as an economic good is an important way of achieving efficient and equitable use, and of encouraging conservation and protection of water resources. (International Conference on Water and Environment, 1992)

A contextual reading of Principle 4 would recognise the economic role of water in order to discourage waste, but would include careful attention to appropriate pricing schemes and subsidies so as to provide access to a basic human right. Though it included specific reference to affordability, in the debate over how to implement Principle 4, a less nuanced interpretation was used to justify calls for simple demand-responsive approaches to water supply and sanitation projects. Under such approaches, communities were expected to take a larger role in demanding improved services, facilities and management schemes, with demand measured by ability to contribute cash, labour and materials (Calaguas, 1999).

Over the last 20–30 years, many governments in developing countries have in fact struggled to finance the capital, operational and maintenance costs of water and sanitation systems, including those associated with occasional expansions and rehabilitation. During that time, the increasing international emphasis on economic approaches to social and environmental problems, and the seeming inevitability of globalisation led to a re-examination of the potential for the private sector to take on these responsibilities.

The perceived advantages of the private sector with regards to capital access and service efficiency seemed to promise that it could reduce costs while increasing service quality and coverage.

Though at least one World Bank study demonstrated no efficiency advantage for the private sector versus the public sector in water service provision (Estache et al., 2005), these perceptions, and a widespread emphasis on market-based approaches to solving development-related problems during this period, stimulated an increased interest in the transfer of such services to the private sector (Beecher, 1999; Thompson, 2001). Privatisation and public–private partnerships were extensively discussed at The Hague Forum on Water Security (Ministerial Declaration of The Hague, 2000), the Bonn International Conference on Freshwater (Bonn International Conference on Freshwater, 2001) and the World Summit on Sustainable Development (World Summit on Sustainable Development, 2002).

Generally, privatisation refers to the 'transfer of some or all of the assets or operations of public systems into private hands. There are numerous ways to privatise water, including the transfer of the responsibility to operate a water delivery or treatment system, the transfer of physical asset ownership along with operational responsibilities, or even the sale of non-physical assets such as water rights to private companies' (Wolff and Hallstein, 2005: 11). Of the four general categories of privatisation, *full privatisation* is least common, because the corporate entity must take on full liability for the project. *Partial private–sector partnerships* include all situations in which responsibility is shared between the private and public sectors through one of several contractual forms such as service and management contracts, lease contracts or concessions. Multinational corporations often utilise these contractual arrangements in order to act through local subsidiaries. *Co-operative models* typically take the form of a government-owned public limited company, combining public ownership and operation with business principles. They are subject to the regulations controlling other companies, but the majority of shares are publicly owned. *Informal sector provision* involves local, small-scaled operations that tend to occur in low- and middle-income countries. The most common form of private-sector participation, in terms of numbers and investment size, is the concession contract (Budds, 2000).

Efforts to privatise water services are based on several arguments involving greater efficiency, expertise and access to capital, as compared to public entities, with increased investments resulting in improved access and availability, particularly in rural areas. It is also argued that privatised contracts can include contractual incentives to encourage better performance and service, and that consumer user fees encourage responsible use of scarce resources (Budds and McGranahan, 2003; Webreck, 2005).

There are equally powerful arguments against privatisation. Privatisation encourages a fragmented perspective on interconnected issues. One essential criticism is that it may fail to serve under-represented communities where necessary capital expenditures are unprofitable; this is of particular concern in the developing world. As a result, privatisation also runs the risk of failing to protect basic rights to water and sanitation. Natural monopolies produced by privatisation tend to overprice and under-produce, thus worsening economic inequities and the affordability of water service. The corporate entities that are chosen to administer privatised services to the public are normally averse to public participation in the development of policy and practice. As their profits are directly affected by the sale of the resource, privatised water suppliers often neglect the potential of water-use efficiency and other strategies that would save money for consumers. Privatised service providers also tend to ignore impacts on ecosystems and

downstream users, and on maintaining levels of protection for water quality (Gleick et al., 2002; Gutierrez et al., 2003). A single-minded focus on marketable aspects of the resource may result in single-purpose water planning and management policies, raising additional concerns for creating and maintaining information and transparency (Rahaman and Varis, 2005).

Privatisation of water supply and sanitation systems has become a key approach to state restructuring in a number of developing economies in Latin America and the Caribbean, but the record of these attempts has been decidedly mixed. The key issues centre on how privatisation is implemented, in what context, to what extent, and in which regulatory environment (International Institute for Environment and Development, 2003; Prasad, 2006). Throughout the region, examples exist of poorly designed concession contracts, poorly conducted renegotiations, underperformance by multinational corporations, excessive tariff increases, extensive rent-seeking behaviour such as lobbying for governmental policies that increase profits, inadequate monitoring and regulatory control, and resultant negative reactions by affected populations (Bosman, 2005).

The case of Cochabamba, Bolivia is one example of the types of problems that can result from a poorly conceived privatisation project. In 1998, as one of the conditions to guarantee a large loan for refinancing water service in Cochabamba, the World Bank required the government to sell the public water system to the private sector. Only one bid was tendered, and the Bolivian government transferred the operation to Aguas del Tunari, a subsidiary of a conglomerate led by Bechtel (Barlow, 2001: 30; Naegele, 2004: 105). Within months after the sale, Aguas del Tunari doubled the price of water, placing it at close to half a month's income for those on minimum wage or unemployed. The Bolivian government also granted monopolies to private water suppliers, advocated full-cost water pricing, and agreed with the World Bank that none of the loan would be used to subsidise water service to the poor. Water from any source, including that from captured rainwater, could only be accessed after purchasing a permit. Service and system connections remained at low levels. The public reacted very strongly against these measures; after several marches and protests, arrests, street violence and the death of one boy, the government revoked its authorisation of the programme (Barlow, 2001).

This, and several other high profile cases around the world (as explored by Alcázar et al., 2000; Hall and Lobina, 2002; Gutierrez et al., 2003; Bosman, 2005), indicate that privatisation of public water services runs the risk of failure if water pricing and service contracts are not carefully analysed and constructed. When approached with an emphasis on profit rather than the provision of high-value public service, and when governmental monitoring and regulation are lacking or ineffective, privatisation efforts have demonstrated drastically lower rates of success (Gleick et al., 2002). The cases strongly suggest that the values of water as a social and environmental, as well as economic, good must be observed in all institutional and operational aspects of management.

Integrated Management

Developing effective, efficient and sustainable management systems is an inherently difficult process that should take advantage of all tools available, not just those prescribed as general solutions by powerful stakeholder groups. Though the future of water services in Latin America will most likely see less dependence on privatisation schemes, governmental and stakeholder involvement in the policy process will not, in and

of itself, guarantee success in achieving sustainable water resources management. One of the most important governmental roles is to assure that management systems embody an integrated perspective on water resources, water pollution, human economic activities and environmental processes. This approach has been captured in a management tool known as integrated water resources management (IWRM). The concept has been under discussion since the middle of the twentieth century, but a widely accepted definition of IWRM was not formulated until 2000, when the Global Water Partnership defined it as 'a process that promotes the coordinated development and management of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems' (Global Water Partnership, 2000: 22).

The *Ministerial Declaration of The Hague on Water Security in the 21st Century* also included the following statement:

> [IWRM] ... includes the planning and management of water resources, both conventional and non-conventional, and land. This takes account of social, economic and environmental factors and integrates surface water, groundwater and the ecosystems through which they flow. It recognises the importance of water quality issues ... [IWRM] depends on collaboration and partnerships at all levels, from individual citizens to international organisations, based on a political commitment to, and wider societal awareness of, the need for water security and the sustainable management of water resources. To achieve integrated water resources management, there is a need for coherent national and, where appropriate, regional and international policies to overcome fragmentation, and for transparent and accountable institutions at all levels. (Ministerial Declaration of The Hague, 2000: 2)

Though there has been criticism that these definitions are vague and may be difficult to apply (Biswas, 2004), what seems clear is that current approaches to water management have not significantly reduced pressures on the quantity or quality of the resource. Trends in water use, population, agriculture, industrialisation and environmental decline all point to the need for a change in management paradigms, aimed at achieving long-term sustainability. Regardless of the definitional complexities, refining the concept of IWRM, developing policies and techniques for its application and creating the institutional structures for its implementation will be critical to the future of urban water services (Ministerial Declaration of The Hague, 2000).

The advantage of IWRM is that, in contrast to single-focus privatisation schemes, it can more effectively address the multiple values and functions of water relative to humans, ecosystems and economies. When fully implemented, IWRM not only deals with water supply and waste-water treatment, but also addresses flood control and drought management, agriculture and poverty alleviation, ecosystem function and overall sustainability. Successful application of this strategy requires a broader, basin-wide focus, which includes consideration of the range of human and environmental requirements for adequate water quality and quantity, effective stakeholder input, and a clear governmental involvement (Rahaman and Varis, 2005).

A fully integrated approach will include equal consideration of land and water management; water quantity and water quality; surface water and ground water; riverine and coastal zone management; upstream and downstream water-related interests; and the relationships among institutional actors (Global Water Partnership, 2000: 24–26).

IWRM also requires sensitivity to cross-sectoral issues in policy-making, including such concerns as the potential economic effects of large-scale capital investment programmes; the interrelated costs and benefits of land use decisions on water-related resources; the full incremental costs of policies that increase demand for water services; the relative values in use, measured in economic and social terms, of policies that allocate water between different uses; the trade-offs in any policy decision between short-term benefits and long-term costs; and the importance of subsidiarity, in which management obligations are undertaken at the lowest appropriate level (Global Water Partnership, 2000: 27–28).

In the attempt to clarify and implement IWRM, certain standards have been advanced as guidance for policy development by resource management agencies. Though they lack the specificity necessary for application in the field, the following principles – developed by the International Water Association (IWA) and United Nations Environment Programme (UNEP) – are fairly representative of those put forward by other institutions and analysts in the field, and suggest a general structure for designing more directly applicable approaches (International Water Association, 2002).

One of the most commonly cited principles by the IWA and UNEP is that IWRM should be applied at the catchment, or river basin, level, thus allowing for a management scheme based on a discrete hydrographic region. Though questions of scale are inherent in its definition, the catchment area is essentially the smallest complete hydrological unit capable of analysis and management. Such approaches create greater potential for integrating the planning and licensing of activities so as to protect water quantity and quality within the designated region. Within the catchment or basin, it's also important that water be holistically managed in concert with co-dependent natural resources, including soil, forests, air and biota. One of the most contentious issues confronting IWRM programmes is the relative weight to be given to human economic goals, in relation to ecosystem needs and functions (International Water Association, 2002).

A related principle prescribes a systems approach that recognises not only individual components of, and impacts on, hydrologic systems, but the relationships and linkages between them. Systems management attempts to anticipate the potential synergies and conflicts among system components, and creates management protocols that reduce as much as possible permanent damage to system functioning under natural and human-related stresses.

Within the IWA/UNEP framework, a different category of concerns for water management policy has to do with social integration of IWRM, most importantly, full participation by all stakeholders, including workers and the community. Resource management reflecting this principle is driven, from the bottom up, by local needs and priorities, and from the top down, by regulatory responsibilities. It is flexible and adaptive, capable of evolving with changing conditions. The social dimensions of water management, including the creation and maintenance of equitable access, also require careful attention to the critical role of women, and the employment and income implications of change. Analyses of water projects have consistently shown that ensuring women's participation in decision-making positively affects both project quality and sustainability.

An overarching principle is that water resources must be equitably allocated. Questions involving potential trade-offs between domestic, agricultural, industrial and environmental needs are inherently difficult to resolve, depending at least in part on regional contexts and values. This requires decision-making that is technically, scientifically and socially informed, in order to avoid conflicts and help facilitate resolution of conflicts that do arise. Existing tools, such as multi-criteria analysis, can help

decision-making by balancing social, ecological and economic considerations. However, probably no other policy or tool is as important in promoting equitable allocation as is fully committed and informed public participation.

At many levels, stakeholders often lack the necessary knowledge and skills for effective participation in setting goals and policies, thus capacity building is essential to guaranteeing the continuous and informed participation of stakeholders. Important categories include education and awareness-raising about water; information resources for policy-making; regulations and compliance; basic infrastructure; and market stability. Part of the process is assuring the availability of information and developing the capacity to use it to make policy and predict responses. This requires sufficient understanding of the hydrological, bio-physical, economic, social and environmental characteristics of a catchment to allow informed policy choices to be made. It also requires some ability to predict the most important responses of a system to factors such as effluent discharges, diffuse pollution, changes in agricultural or other land use practices and the building of water retention structures. As examples, the drainage of wetlands or channelisation of streams for agricultural purposes will have drastic effects on water retention and groundwater levels; clearing land for agriculture will normally increase sediment pollution in nearby waterways, unless measures are taken to buffer those waterways. It is the responsibility of government and water managers to build these capacities in the stakeholder communities.

Overall, IWRM has little possibility of success without central government support through the creation and maintenance of an enabling environment. The role of central government should be one of leadership, to facilitate and coordinate the development and transfer of skills, and to assist with the provision of technical advice and financial support to local groups and individuals. Appropriate institutional arrangements may be required to ensure effective inter-departmental collaboration. Instead of allowing agencies and departments to conduct planning and regulation of interrelated activities in isolation, careful institutional analysis and modification can promote the sharing of information and increase the potential for licensed projects to sustain water resources.

A closely related obligation of central governments is to assure reliable and sustained financing. There must be a clear and long-term commitment from government to provide financial and human resource support. General budgetary commitments can be supplemented when water and sanitation markets are viable, and when there is active reinvestment in the sector. Where necessary, investment and reinvestment decisions should focus on adoption of the best existing technologies and practices, including management instruments. Multi-stakeholder, consensus-oriented forums for IWRM should avoid lowest-common denominator solutions through adherence to best management practices (BMPs) and best available technologies (BATs) that are adapted to local needs.

Management structures should also include consideration of full-cost pricing for cost recovery, complemented by targeted subsidies. Expression of this principle, however, must place high priority on the interests of the poor, who might not be sufficiently protected, even with an associated subsidy system (Walker et al., 2000). When applied in its narrowest sense, this principle may conflict with the principle that water is a social benefit and a human right (International Water Association, 2002).

The implementation of IWRM principles will require new forms of 'water governance' as a prerequisite to construction of water supply and sanitation services. Governance, as a term, involves the manner in which allocative and regulatory politics

are exercised in the management of resources, and generally includes both the formal and informal institutions by which authority is exercised (Rogers and Hall, 2003). IWRM will dictate a new management framework with changes in existing interactions between politics, laws, regulations, institutions, civil society and the consumer. It will essentially involve the creation of an environment that facilitates efficient private and public sector initiatives and stakeholder involvement in prioritising needs (Rogers and Hall, 2003).

Integrative Soft Path

'Soft path' strategies represent an evolution in thinking about water management and water services that attempts to reconceptualise the purposes of water and how it is used. IWRM, despite its role in the creation of more sustainable water management strategies, remains primarily focused on dominant models of water supply and sanitation in which services are provided by way of costly, resource-intensive projects. Given their costs and environmental impacts, large-scaled, centralised and capital-intensive approaches to water supply and sanitation seem destined to become less feasible as solutions to the problems posed by growing human demands and constant or diminishing environmental supply.

For decades, these more industrialised 'hard path' approaches have dominated thinking about how to manage and protect water resources, but have produced many unintended negative consequences, at the expense of more potentially effective strategies. The 'hard path' techniques tend to focus almost exclusively on supply management (Gleick, 2002), in which the fundamental question is 'how can we meet projected water service needs given current trends in water use and population growth'? The predominant outcomes of 'hard path' thinking are the construction of dams, pipelines, canals, wells, treatment plants, desalination systems and reservoirs (Brandes and Brooks, 2005). Intermediate approaches to provision of water services have been more concerned with demand management, in which the fundamental concern is how to reduce needs for water in order to conserve the resource, save money and reduce environmental impacts. The outcomes of these strategies are efficiency gains through technical fixes and consumer education.

The emerging 'soft path' approach tends to look at water not as an end-product, but as the means to accomplish certain tasks. The fundamental question becomes 'how can the services currently provided by water be delivered in ways that recognise the need for economic, social and ecological sustainability'? The outcomes of the process are options to help change patterns of use and reuse, and reduce water consumption through innovation, conservation and reallocation, with more water left *in situ* (Gleick, 2002; Brandes and Brooks, 2005). The concept and practice of IWRM have begun to evolve, incorporating these newer management philosophies and practices.

Among other goals, soft path approaches attempt to improve the productivity of water use. Globally, agriculture is the largest user of water, rising to as high as 80 per cent of water withdrawals in some developing countries. Agricultural operators do not want to use water *per se*; they want to produce crops. Improving irrigation technology or crop characteristics permits growers to produce more per unit of water. Drip irrigation, land levelling, direct seeding, changes in plant varieties, low-energy precision application sprinklers and more precise information about the timing and placement of irrigation all represent efficiency improvements promoted by soft path strategies (Gleick, 2003).

Instead of constantly seeking new sources of supply, the soft path attempts to match water services and qualities to users' needs. One of the more obvious examples is the creation of water systems that supply water of various qualities. In these systems, higher-quality water is reserved for uses that require higher quality; storm water run-off, grey water from sinks, baths and showers, and reclaimed waste water are utilised for landscape irrigation and other non-potable uses. Soft path approaches also carefully employ tools such as water markets and pricing, where appropriate, as a means of encouraging efficient use, equitable resource distribution and sustainability over time; and they include local communities in the decision-making process for water management, allocation and use (Wolff and Gleick, 2002; Gleick, 2003). Many of these strategies utilise decentralised or distributed systems that are more non-structural in character, as well as low-tech approaches to efficiency and sanitation, and the assimilative and treatment capacity of vegetation and soils. Rather than collecting storm water and its associated pollutants from roads and other impervious surfaces, then conveying it through culverts and pipes into local waterways, one soft path solution is to maintain natural vegetation along roads and create decentralised systems of relatively small, distributed 'water gardens', constructed wetlands and other forms of green infrastructure to capture and treat storm water onsite.

Soft path approaches to water supply, water treatment, sanitation and run-off management are situationally dependent and highly integrated, both physically and institutionally. The goal is to take advantage of local hydrological resources; use the treatment capacities of urban watershed soils and vegetation to help manage storm water; and employ new technologies for waste-water treatment and reclamation/reuse. Techniques such as cisterns and other types of rainfall/storm-water harvesting systems, waterless toilets, green roofs and native landscaping have great potential for making urban systems much less dependent on hard path technologies.

The water soft path also emphasises greatly increased end-use efficiencies, carefully designed management systems to avoid water loss, and matching of system outputs to the exact quantities and qualities required for appropriate classes of end-use. The approaches to waste-water treatment systems and scales aim to match the characteristics of the water produced by different end-uses to nearby or regional reuse opportunities (Pinkham, 1999). Optimally, supply and treatment systems would not be providing water for landscape irrigation, nor probably for toilet flushing or other uses that do not require a high level of water quality, thus the sizing of these systems can be scaled down, saving resources and energy. If an existing treatment system has been sized to provide high-quality water for irrigation, the service capacity of that facility for high-quality domestic uses can be extended by the adoption of other components of the soft water strategy that reduce the need to use high-quality water for irrigation.

The synthesis of IWRM and soft path strategies represents a more sustainable option for the provision of water services. There appears to be great potential for conventional methods of water supply, storm-water and waste-water management to improve, while better technologies, as well as refinements of older technologies, continue to emerge as new options (Pinkham, 1999; Pronk and Kazner, 2008: 13–24). Institutional and managerial innovations are also evolving. The 'integrative soft path' that they embody signifies a new paradigm for the supply of urban water services. The old paradigm and the emerging paradigm are broadly characterised and contrasted in Table 1.

Generally, this emerging view on water management recognises the relationships between human beings, natural systems and water-related resources, and attempts to close the gaps that have been created by older development practices. Human excreta

Table 1. Comparison of Water Services Management paradigms

Older paradigm	Emerging paradigm
Human waste is a nuisance. Must be disposed of after minimum treatment to reduce its harmful properties.	***Human waste is a resource***. Should be processed effectively and, where possible, put to use fertilising land, trees and crops.
Stormwater is a nuisance. Convey it away from urban areas as rapidly as possible.	***Stormwater is a resource***. Harvest it as water supply and infiltrate or retain it to support urban aquifers, waterways and vegetation.
Build to demand. It is necessary to build more capacity as demand increases.	***Manage demand***. Take advantage of all cost-effective options before increasing infrastructure capacity.
Demand is a matter of quantity. Amount of water required or produced by end-users is the only end-use parameter relevant to infrastructure choices. Treat all supply-side water to potable standards, and collect all waste water for treatment in one system.	***Demand is multifaceted***. Infrastructure choices should match the varying characteristics of water required or produced by different end-users: quantity, quality (biological, chemical, physical), level of reliability, etc.
One use (throughput). Water follows a one-way path from supply, to single use, to treatment and disposal, to the environment.	***Reuse and reclamation***. Water can be used multiple times, by cascading it from higher to lower-quality needs, and by reclamation treatment for return to the supply side of the infrastructure.
Gray infrastructure. The only elements of 'infrastructure' are constructed of concrete, metal and plastic.	***Green infrastructure***. Besides pipes and treatment plants, infrastructure includes the natural capacities of soil and vegetation to absorb and treat water.
Bigger/centralised is better. Larger systems, especially treatment plants, attain economies of scale.	***Small/decentralised is often better***. Small-scale systems are effective and can be economic, especially when dis-economies of scale in conventional distribution/collection networks are factored in.
Limit complexity: use standard solutions. A small number of technologies, well known by urban water professionals, define the range of responsible infrastructure choices.	***Pursue diverse solutions***. An array of situation-tuned solutions is required in complex and resource-limited urban environments, enabled by new management technologies and strategies.
Integration by accident. Water supply, storm-water, and waste-water systems may be managed by the same agency. Physically, however, the systems should be separated.	***Physical and institutional integration by design***. Important linkages can be made between physical infrastructures for water supply, storm-water, and waste-water management. Realising the benefits of integration requires highly coordinated management.
Collaboration = public relations. Approach other agencies and the public only when approval of pre-chosen solutions is required.	***Collaboration = engagement***. Actively enlist other agencies and the public in the search for effective, multi-benefit solutions.

Source: Adapted from Pinkham (1999).

are seen as potential plant nutrients rather than pollutants; storm water from impervious surfaces is seen as a potential complement to other sources of water for lawns and landscapes. Instead of attempting to supply unlimited amounts of high-quality water for all uses, the emerging paradigm works on matching quantities and qualities of water to appropriate end-uses, while creatively managing demand. It also recognises the critical role that intact vegetative systems play in maintaining the quality of water as it flows from human-dominated systems back into the environment. Institutional integration, effective stakeholder input and collaboration are seen as absolutely essential to creating nuanced and effective management strategies, rather than inconvenient requirements that must be observed in passing.

Conclusion

The challenges associated with an integrative soft path approach to urban water services are not only technical but also institutional, particularly in many parts of Latin America, where until recently, standard neoliberal approaches to development have dominated (Laurell, 2000: 307; Wood and Roberts, 2005). Though the financial viability and long-term maintenance of IWRM and the soft path would appear to be more achievable than compartmentalised 'hard path' management, developing solutions that can be accepted and incorporated into a constantly changing political and cultural landscape will be the test of the newly emerging paradigm.

Ultimately, the integrative soft path approach should have much greater potential to meet long-term water service needs – at lower financial, social and environmental cost – than today's centralised, extremely capital-intensive, energy-intensive and relatively wasteful management regimes. Despite the variation among Latin American cities and states, whether the situation requires incremental upgrading, complete replacement, or initial construction, the basic principles of an integrative soft path approach should be applicable. If comprehensive water planning, incorporating these principles, is in place before urban projects are undertaken, there is a greater possibility of measured progress over time, ultimately resulting in a more sustainable water management regime. Given the current political and financial investment in older schemes however, the transition to newer approaches will not take place quickly or easily. Most legal and policy structures do not supply specific support for a soft path approach, though economic forces and cultural adaptation should slowly force the necessary changes.

Some IWRM/soft path technologies and management approaches have been adopted and applied in specific cases, but it remains to be seen how, and over what period of time, technical and political opinion will shift in order to provide wide-ranging support for this form of management. What does not seem to be in question is that more decentralised, diverse, non-structural approaches that focus on the service or function provided by waters, and that take advantage of the natural assimilative capacities of soil and vegetation, represent at least part of the solution to the problem of supplying water services to increasing human populations.

Given their role in representing and protecting public interests in the development process, governmental entities at all levels in Latin America will play an important part in addressing the conditions under which the transition to an integrated, soft path can be made. These responsibilities will include 'visioning' comprehensive schemes, developing integrated planning and regulatory programmes to encourage resource-efficient development patterns, producing extensive educational programmes, incentivising adoption

of appropriate technologies, assuring full public participation in development of water policies, and carefully crafting the contractual obligations and monitoring procedures under which privatisation of services can take place in appropriate circumstances.

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